DuPont™ Vertrel® C-HD

SPECIALTY FLUID

Technical Information

Aerosol Solvent Applications for Oil, Grease, and Flux Removal

Introduction

DuPont™ Vertrel® C-HD is a proprietary blend of DuPont™ Vertrel® XF hydrofluorocarbon (2,3-dihydrodecafluoropentane) with trans-1,2-dichloroethylene and ethanol. It is designed specifically for aerosol cleaning and flushing applications.

DuPont™ Vertrel® C-HD has "zero" ozone-depletion potential, and low global warming potential. It can replace CFC-113, 1,1,1-trichloroethane (1,1,1-TCA), hydrochlorofluorocarbons (HCFCs), and perfluorocarbons (PFCs) in many aerosol applications. All components of DuPont™ Vertrel® C-HD are accepted under the USA EPA's Significant New Alternatives Policy (SNAP).

This product bulletin summarizes product property, application and use, safety, health, environmental, and regulatory information. Users should also consult the Material Safety Data Sheet (MSDS) for additional information.

Physical properties of DuPont™ Vertrel® C-HD are shown in **Table 1**.

Applications

DuPont™ Vertrel® C-HD Specialty Fluid is intended for use as an ingredient in the formulation of non-flammable, fast-drying aerosol solvent preparations. It offers superior solvency for oils, greases, and tough to remove fluxes as well as excellent environmental properties. It is one of the most economical solvent available with this combination of properties.

DuPont™ Vertrel® C-HD can be used as formulated with a propellant such as Dymel® 134a for heavy duty defluxing or hydrocarbon cleaning applications.

DuPont™ Vertrel® C-HD is not intended for use in vapor degreasing equipment. For applications requiring use in cleaning equipment, see DuPont™ Vertrel® CF, DuPont™ Vertrel® CMS or DuPont™ Vertrel® CCA.

Table 1
Physical Properties

Property[a]	Vertrel® C-HD
Molecular Weight	106
Boiling Point, °C (°F)	41 (106)
Liquid Density, kg/ltr (lb/gal)	1.26 (10.5)
Vapor Pressure, hPa	0.344
Surface Tension, N/m	0.0194
Freezing Point, °C (°F)	<–50 (<–58)
Solubility of Water, wt%	0.3
Heat of Vaporization at Boiling Point, kJ/kg	310.1
Heat Capacity at 20°C, kJ/kg·°C	1.30
Viscosity, cPs	0.48
Flashpoint, °C (°F)	
Closed Cup	None[b]
Open Cup	None to 39 (102)[c, d]
Vapor Flammability in Air, vol%	
Lower Limit	4.3
Upper Limit	13.5

[a] At 25°C (77°F), except where indicated.
[b] Pensky-Martens Closed Cup Tester (ASTM D 93)
[c] Tag Open Cup Tester (ASTM D1310) – no fire point was observed with Vertrel® C-HD.
[d] Tag Open Cup Flash Point may vary due to compositional change during testing. See Safety/Flammability section.

Plastic and Elastomer Compatibility

Most plastics commonly used for components mounted on printed wiring board assemblies can be safely cleaned in DuPont™ Vertrel® C-HD. Acrylic, ABS, and polycarbonate parts, particularly if under stress, may show slight cracking or crazing damage and should be tested. EPDM, butyl rubber, Buna-S, and neoprene are recommended for elastomeric parts.

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Elastomer swelling and shrinking will, in most cases, revert to within a few percent of original size after air drying. Swell, shrinkage, and extractables are strongly affected by the compounding agents, plasticizers, and curing used in the manufacture of plastics and elastomers. Therefore, prior in-use testing is particularly important.

Tables 2 and **3** summarize test results for 15-minute exposures of unstressed plastics and elastomers to DuPont™ Vertrel® C-HD. This compatibility data should be conservative for most aerosol cleaning applications, since exposure times will typically be much shorter.

Table 2
Plastic Compatibility
Immersion: 15 Minutes at Room Temperature

Compatible	
Polyethylene	Acetal
Polyester, PET, PBT	Epoxy
Polyimide, PI, PEI, PAI	Liquid Crystal Polymer
Polyetherketone, PEK	Phenolic
Polyaryletherketone, PEEK	PTFE, ETFE
Polyarylsulfone, PAS	Polypropylene
Polyphenylene Sulfide, PPS	Polyvinylchloride
Polysulfone, PSO	Chlorinated PVC
	Ionomer
Incompatible[a]	
Polystyrene	ABS
Polyphenylene Oxide, PPO	Acrylic
	Cellulosic

[a] Material composition varies depending upon compounding agents, plasticizers, processing, etc. Specific materials should be tested for compatibility with solvent.

Table 3
Elastomer Compatibility
Immersion: 15 Minutes at Room Temperature

Compatible	
Buna N, NBR, Nitrile	Buna S, SBR, GRS
Butyl Rubber, IIR	Chlorosulfonated PE
EPM, EPDM, Nordel®	Polysulfide
Natural Rubber, Isoprene	Neoprene
Urethane	Viton® B
	Silicone
Incompatible[a]	
None Tested	

[a] Material composition varies depending upon compounding agents, plasticizers, processing, etc. Specific materials should be tested for compatibility with solvent.

Metals and Other Compatibility

DuPont™ Vertrel® C-HD was found compatible with zinc, stainless steel, aluminum, copper, and brass.

DuPont™ Vertrel® C-HD is not compatible with strong bases; therefore, contact with highly basic process materials is not recommended.

Safety/Exposure Limits

Users of DuPont™ Vertrel® C-HD must read and understand the DuPont Material Safety Data Sheet (MSDS). Data from toxicity studies have demonstrated that the components of DuPont™ Vertrel® C-HD have low toxicity and are safe when handled in accordance with DuPont recommendations and when exposures are maintained below recommended exposure limits. DuPont™ Vertrel® C-HD is a skin and eye irritant and has low acute inhalation toxicity. As with many safely used halocarbon materials, intentional misuse or deliberate inhalation may result in suffocation by oxygen displacement, central nervous system effects or cardiac sensitization effects. Gross over-exposure may be fatal. **Table 4** shows the applicable exposure limits for the component materials of DuPont™ Vertrel® C-HD.

Table 4
Exposure Limits

Component	Limit, ppm		Type
Vertrel® XF	AEL[a]	200 400	8- and 12-hr TWA Ceiling[b]
Trans-1,2-dichloroethylene	TLV[c]	200	8-hr TWA
Ethanol	AEL	1000	8- and 12-hr TWA
	TLV	1000	8-hr TWA
Vertrel® C-HD	AEL[a, b]	226	Calculated[d]

[a] AEL (Acceptable Exposure Limit) is an airborne inhalation exposure limit established by DuPont that specifies time-weighted average concentrations to which nearly all workers may be repeatedly exposed without adverse effects.

[b] A ceiling limit is the concentration that should not be exceeded during any part of the working day. The ceiling limit for individual components applies to the blend product as well.

[c] TLV (Threshold Limit Value) is an air-borne inhalation exposure limit established by the American Conference of Government and Industrial Hygienists (ACGIH) that specifies time-weighted average concentrations to which nearly all workers may be repeatedly exposed without adverse effects.

[d] Calculated in accordance with ACGIH formula for TLVs for mixtures.

Safety/Flammability

DuPont™ Vertrel® C-HD exhibits no closed cup flash point per the Pensky-Martens Closed Cup Tester (ASTM D93) and is not classified as a flammable liquid by NFPA or DOT. The product does exhibit vapor flammability limits in air, and has the potential to ignite in an open vessel or in case of a spill, if an ignition source is present. However, laboratory tests with virgin solvent in an open vessel show the solvent will not sustain combustion, and quickly self extinguishes. Users should clear equipment of all vapors and liquids before performing any maintenance operations that could result in an ignition source.

Flash point data and limits of flammability in air provide the user with additional information that should be used as elements of a fire risk assessment and to determine guidelines for the safe handling of volatile chemicals. Users should assure compliance with NFPA standards and local fire codes.

Recovery

DuPont™ Vertrel® C-HD is not normally recovered. Users should test spent solvent to ensure proper classification for waste disposal.

Storage/Handling

DuPont™ Vertrel® C-HD is thermally stable and does not oxidize or degrade during storage. Store in a clean, dry area. Protect from freezing temperatures. If solvent is stored below –10°C (14°F), mix prior to use. Do not allow stored product to exceed 52°C (125°F) to prevent leakage or potential rupture of container from pressure and expansion.

Although DuPont™ Vertrel® C-HD is not classified as a flammable liquid by DOT/NFPA, it does have flammable limits in air, and has the potential to ignite in an open vessel or in case of a spill, if an ignition source is present. A drum pump is recommended to dispense the product from its container. If an electric drum pump is used, avoid operation near open equipment or when solvent vapors are present. In these cases, consideration should be given to the use of a flammable-rated drum pump. If a large release of vapors occurs, such as from a large leak or spill, the vapors may concentrate near the floor or in subfloor areas and displace the oxygen available for breathing, causing suffocation. Evacuate everyone until the area has been well ventilated. Do not re-enter the affected areas without self-contained breathing apparatus unless the DuPont™ Vertrel® C-HD concentration is below the AEL.

Environmental Legislation

DuPont™ Vertrel® specialty fluids have "zero" ozone-depletion potential and low global warming potential **(Table 5)**. They are used as alternatives to CFC-113, methylchloroform, hydrochlorofluorocarbons (HCFCs), and perfluorocarbons (PFCs) in many critical cleaning, drying, carrier fluid, and other high-value specialty uses where reliability is paramount.

DuPont™ Vertrel® C-HD is accepted by the U.S. Environmental Protection Agency (EPA) under the Significant New Alternatives Policy (SNAP) program, as a substitute for ozone-depleting substances.

The components of DuPont™ Vertrel® C-HD are listed in the TSCA inventory. One component, HFC-43-10mee, is subject to the Significant New Use Rule (SNUR) and should be used only in the indicated applications. See MSDS Regulatory Section.

DuPont™ Vertrel® C-HD is not included in the SARA Title III Section 313 list of toxic chemicals, and is not subject to SARA Title III (EPCRA) reporting requirements.

Table 5
Environmental Properties

Property	ODP[a]	GWP* (100 yr ITH)[b]	Photochemical VOC[c]
Vertrel® XF	0	1300	Exempt
Trans-1,2-dichloroethylene	0	—	Not Exempt
Ethanol	0	—	Not Exempt

* IPCC Second Assessment Report (1995)
[a] ODP – ozone depletion potential
[b] GWP – global warming potential
[c] VOC – volatile organic compound

Packaging and Availability

DuPont™ Vertrel® C-HD is commercially available in 55-gal (208-L) drums with a net weight of 660 lb (299 kg), and in 5-gal (19-L) pails with a net weight of 60 lb (27 kg). Customers are encouraged to secure samples now for testing.

Specifications

Composition and specifications are shown in **Table 6**. All components are listed in the TSCA Inventory.

Table 6
Vertrel® C-HD Specifications

Vertrel® XF, wt%	25.5 ± 1.0
Trans-1,2-dichloroethylene, wt%	68.2 ± 1.0
Ethanol (SDA), wt%	6.3 ± 0.3
Nonvolatile Residue, ppm wt	10 max.
Moisture, ppm wt	200 max.
Appearance	Clear, colorless

If you are interested in purchasing or finding out more about DuPont™ Vertrel® please use the list below to contact the DuPont office closest to you.

North America

DuPont Fluorochemicals
Customer Service Center
Chestnut Run Plaza 702
Wilmington, DE 19880-0702
Ph: 800-969-4758 (U.S. only)
Ph: 1-302-774-1160 (Outside U.S.)

Europe, Middle East, Africa

DuPont de Nemours Intl., S.A.
2, Chemin du Pavilion
CH-1218 Le Grand-Saconnex/GE
Switzerland
Ph: 41 22 717 5296
Fax: 41 22 717 6169

Asia Pacific

DuPont-Mitsui Fluorochemicals Co. Ltd.
Chiyoda Honsha Building
1-5-18 Sarugaku-cho
Chiyoda-Ku Tokyo 101
Japan
Ph: 03 5281 5850 (Japan only)
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